

AMENDMENTS TO THE CLAIMS

The following listing of claims will replace all prior versions and listings of claims in the application.

LISTING OF CLAIMS

1-16. (cancelled).

17. (previously presented) A method of forming an imide hydrogen storage material represented by the formula, $M^c(NH)^{-2}_{c/2}$, comprising: reacting an amide $MI^d(NH_2)^{-1}_d$ with a hydride MII^fH_f to form the imide hydrogen storage material that reversibly stores hydrogen; where M represents at least one cationic species selected from the group consisting of Li, Mg, Na, B, Al, Be, and Zn; MI and MII represent cationic species other than hydrogen; and c, d, and f respectively represent average valence states of respectively said M, MI and MII.

18. (original) The method of Claim 17 where the amide is lithium amide, the hydride is lithium hydride, and the imide is lithium imide.

19. (previously presented) The method of Claim 17 wherein at least two of M, MI and MII are distinct cationic species.

20. (previously presented) A method of making an imide hydrogen storage material represented by $M^c(NH)^{-2}_{c/2}$, comprising: reacting a nitride represented by the formula $MIII^gN_{3/g}$ with an amide represented by $MI^d(NH_2)_d^{-1}$, where M represents at least one cationic species selected from the group consisting of Li, Mg, Na, B, Al, Be, and Zn; MI and MIII represent cationic species other than hydrogen, and c, d and g represent average valence states of respectively said M, MI and MIII.

21. (previously presented) A method for forming a reversible imide hydrogen storage material represented by $M^c(NH)^{-2}_{c/2}$, comprising: heating an amide compound represented by $MI^d(NH_2)_d^{-1}$ for a time and at a temperature sufficient to produce reaction product comprising said reversible imide hydrogen storage material and ammonia (NH_3); and separating at least a portion of said ammonia from said reaction product to provide said imide material; where M represents at least one cationic species selected from the group consisting of Li, Mg, Na, B, Al, Be, and Zn; and MI represent cationic species other than hydrogen, and where c and d represent average valence states of respectively M and MI.

22. (previously presented) A hydrogen storage composition having an initial hydrogenated state and a subsequent dehydrogenated state:

(a) in said initial hydrogenated state, said composition comprises an amide and a hydride; and

(b) in said subsequent dehydrogenated state, said composition comprises an imide represented by $M^c(NH)^{-2}_{c/2}$, where M represents at least one cationic species selected from the group consisting of Li, Mg, Na, B, Al, Be, and Zn, and c represents an average valence state of M, where said imide is regenerated to said initial hydrogenated state by exposure to hydrogen.

23. (original) The composition of Claim 22 wherein said imide is represented by the formula Li_2NH .

24. (original) The composition of Claim 22 wherein said amide is represented by the formula $LiNH_2$.

25. (previously presented) The composition of Claim 22 wherein said hydride is represented by the formula LiH .

26. (previously presented) A method of producing a source of hydrogen gas comprising: liberating hydrogen from a hydrogenated composition comprising an amide and a hydride by heating said composition at an elevated temperature sufficient to evolve hydrogen gas therefrom so as to produce dehydrogenated product comprising an imide represented by $M^c(NH)^{-2}_{c/2}$, where M represents at least one cationic species selected from the group consisting of Li, Mg, Na, B, Al, Be, and Zn, and c represents an average valence state of M; and then regenerating said hydrogenated composition by exposing said dehydrogenated product to hydrogen gas.

27. (cancelled).

28. (original) The method of Claim 26 wherein said liberating of hydrogen is conducted at an elevated temperature greater than about 125°C.

29. (original) The method of Claim 26 wherein said liberating of hydrogen is conducted at an elevated temperature greater than about 150°C.

30. (original) The method of Claim 26 wherein said regenerating is conducted at an elevated pressure.

31. (original) The method of Claim 26 wherein said regenerating is conducted at an elevated pressure greater than about 10 kPa.

32. (original) The method of Claim 26 wherein said regenerating is conducted at an elevated pressure greater than about 200 kPa.

33. (previously presented) A method of cycling hydrogen comprising: mixing together at least two distinct hydrogen-containing compounds in particle form and heating said particles to release hydrogen and form an imide represented by $M^c(NH)^{-2}_{c/2}$, where M represents at least one cationic species selected from the group consisting of Li, Mg, Na, B, Al, Be, and Zn, and c represents an average valence state of M; and then storing hydrogen by reacting hydrogen with said imide to form at least one of said two distinct hydrogen-containing compounds.

34. (previously presented) The method of Claim 33 wherein said at least two distinct compounds comprise an amide and a hydride.

35. (cancelled).

36. (previously presented) The method of Claim 33 wherein said at least two distinct compounds comprise a first compound represented by $MI^d(NH_2)^{-1}_d$ (amide) and a second compound represented by MII^fH_f (hydride), where MI and MII respectively represent cationic species or a mixture of cationic species other than hydrogen, and d represents an average valence state of MI and f represents an average valence state MII.

37. (previously presented) The method of Claim 33 wherein said imide is lithium imide represented by Li_2NH and said distinct compounds comprise a first compound represented by LiNH_2 , and a second compound represented by LiH .

38. (previously presented) The method of Claim 35 wherein M comprises an element selected from the group consisting of Li, Mg, Na, Be, and mixtures thereof.

39. (previously presented) The method of Claim 34 wherein said imide is represented by the formula MgNH , said amide is represented by the formula $\text{Mg}(\text{NH}_2)_2$ and said hydride is represented by the formula MgH_2 .

40. (previously presented) The method of Claim 36 wherein at least two cationic species selected from the group consisting of said M, MI and MII are distinct cationic species.

41. (previously presented) The method of Claim 40 wherein at least one cationic species selected from the group consisting of said MI and MII comprises said cationic species selected as M and further MI and MII optionally comprise an additional element independently selected from the group consisting of CH_3 , Al, As, B, Ba, Be, Ca, Cd, Ce, Cs, Cu, Eu, Fe, Ga, Gd, Ge, Hf, Hg, In, K, La, Li, Mg, Mn, Na, Nd, Ni, Pb, Pr, Rb, Sb, Sc, Se, Si, Sm, Sn, Sr, Th, Ti, Tl, W, Y, Yb, Zn, Zr, and mixtures thereof.

42. (previously presented) The method of Claim 40 wherein at least one cationic species selected from the group consisting of said MI and MII comprises said cationic species selected as M and further MI and MII optionally comprise an additional element independently selected from the group consisting of Ba, Be, Ca, Cs, Eu, In, K, La, Li, Mg, Na, Ni, Rb, Sm, Sr, Yb, and mixtures thereof.

43. (previously presented) The method of Claim 40 wherein at least one cationic species selected from the group consisting of said MI and MII comprises said cationic species selected as M and further MI and MII optionally comprise an additional element independently selected from the group consisting of Ba, Ca, Eu, La, Li, Mg, Si, Sr, Th, Ti, Zr, and mixtures thereof.

44. (previously presented) The method of Claim 40 wherein at least one of cationic species selected from the group consisting said MI and MII comprises said cationic species selected as M and further MI and MII optionally comprise an additional element independently selected from the group consisting of Ba, Ca, Si, Sr, Th, Ti, Zr, and mixtures thereof.

45. (previously presented) The method of Claim 40 wherein at least one cationic species selected from the group consisting of said MI and MII comprises said cationic species selected as M and further MI and MII optionally comprise an additional element independently selected from the group consisting of Al, Ba, Be, Ca, Ce, Cs, Eu,

Ga, Gd, In, K, La, Li, Mg, Mn, Na, Nd, Pb, Rb, Si, Sm, Sn, Sr, Y, Yb, Zn, and mixtures thereof.

46. (previously presented) The method of Claim 40 wherein M, MI and MII are each elements independently selected from the group consisting of Be, Mg, Li, Na, and mixtures thereof.

47. (previously presented) The method of Claim 33 wherein said particles are mixed together by milling.

48. (previously presented) A hydrogen storage system having a hydrogenated state and a dehydrogenated state:

(a) said hydrogenated state comprises a first group of particles containing an amide and a second group of particles containing a hydride; and

(b) said dehydrogenated state comprises an imide represented by $M^c(NH)^{-2}_{c/2}$, where M represents at least one cationic species selected from the group consisting of Li, Mg, Na, B, Al, Be, and Zn, and c represents an average valence state of M, that is regenerated to said hydrogenated state by exposure to hydrogen.

49. (previously presented) The system of Claim 48 wherein said hydrogenated state is a first condition, said dehydrogenated state is a second condition and wherein a third condition is a hydrogenated state comprising at least one of an amide and a hydride.

50. (previously presented) A source of hydrogen comprising a hydrogenated state comprising an amide and a hydride and a dehydrogenated state comprising an imide represented by $M^c(NH)^{-2}_{c/2}$, where M represents at least one cationic species selected from the group consisting of: Li, Mg, Na, B, Al, Be, and Zn, and c represents an average valence state of M, where said imide is formed by reacting particles containing said amide and particles containing said hydride to release hydrogen, where said imide is regenerated to the hydrogenated state by exposure to hydrogen to form at least one of the group consisting of: said amide and said hydride.

51. (previously presented) The source of Claim 50 where the amide is lithium amide and the hydride is lithium hydride.